BEPC On-line Runtime Database Service System

P.Shi   and   L.Ma

Institute of High Energy Physics, Chinese Academia of Sciences
P.O.Box 918 (10), Beijing 100039, China
ship@bepc3.ihep.ac.cn

Abstract

An On-line Runtime Database Service System based on client/server model via TCP/IP has been introduced to BEPC. It provides various services such as data stores, queries, statistics, analysis and reports. The kernel of the system is an on-line SQL Server database. Users such as specialists, machine operators and managers can get data and charts from any machine connected to the network. They can also use Web Browsers to get information. The system has been running successfully since the BEPC96' autumn startup. This paper describes the overall design and functions of the system.

1   Introduction

The Beijing Electron Position Collider (BEPC) is a large experiment physics equipment for high energy physics and synchrotron radiation research. Much   valuable research and exploration have been done on BEPC by physicists. With this in-depth of physics research, the traditional methods of manual data recording and data querying are not suitable for the demands of high efficiency.

The BEPC on-line runtime database service system has been in service since the BEPC96' autumn startup. The system gives the operators, accelerate physicists, engineers, managers and other users continuous service   twenty-four hours each day and seven days each week. The users can easily acquire the BEPC machine parameters they want for physical experiments, machine studies and BEPC running statistics. The establishment of the database service system improves the running efficiency of BEPC, and it also provides a very useful tool for troubleshooting BEPC.

2   System layout

The first step of the BEPC beam diagnostic system upgrade was performed from the beginning of 1995 to the middle of 1996. The PC based client/server model network system utilizing TCP/IP has been installed. Under these circumstances, the database service system can be installed.

2.1 Client/Server model

Similar to many other laboratories, the beam diagnostic system   of   BEPC is a distributed system, so the client-/server   model   is   the   nature   choice   for   the BEPC   beam   diagnostic system. The flexible and scaleable features of the client/server model are suitable for the beam diagnostic system. Because of the high performance, low price and the large number of providers of both hardware and software, personal computers (PCs) were added to the beam diagnostic system to take the responsibilities of device control and data acquisition.

2.2 Windows NT as the network platform

With the rapid progression of computer technology, it is difficult to make a suitable choice of computer model and operating system. Many issues have to be carefully considered, such as modularity, reliability, the vendor support, the vendor documentation, cost and our financial support.

When making our choice, we must consider sufficient functionality and ease-of-use. Considering that our operating environment demands long-term reliability, industrial PCs were chosen for instrument control. Another high performance PC server with a large memory and hard disk was used as the database server and the data transmission server.

Being   an   excellent   application   service   platform, Microsoft Windows NT was chosen as the primary software platform. Windows NT Server provides the network operation system (NOS), and also the application server. Both Windows NT Workstation and   Windows 95 are utilized on client workstations.

2.3 Microsoft SQL Server as the database server

Microsoft   SQL   Server   is   a   relational   database management system (RDBMS) which is well integrated with Windows NT. It is specially designed for the distributed client/server computing environment. We   also benefit from its internal data backup system, strong data management tools and the open client/server architecture. Microsoft SQL Server is therefore the kernel of BEPC database service system. Any computer connected with the BEPC network can be a client of the service system, and all of the BEPC staff can get the information they need in their offices using our system.

3   Database implementation

3.1 data description

All of the data in our system can be planed in the following two categories.

- Beam diagnostic data
(important BEPC operating information),
    - beam current
    - injection rate
    - beam position measurement data

- beam size and bunch length
- beam energy
- Equipment data (hardware setpoints):
  - magnet power supply setpoint for the storage ring and the transportation line
  - accelerating RF values
  - vacuum values

3.2 data acquiring

As shown in figure 1, the data acquisition system gets data from the BEPC control computer and also from various local PCs. These PCs get data from the front-end electronics and instrumentation via CAMAC or GPIB. All the data are gathered in a dynamic database first. Since the data are collected from PC and VAX systems of different platforms, the TCP/IP protocol is used in the dynamic database system. An Open Database Connection (ODBC) provides the channel from the dynamic database to the logging database.

3.3 data retrieving

A client workstation will have access to our system after performing the following steps.
- connect PC to the BEPC network
- install Microsoft windows 95, Microsoft Windows 95 or Microsoft Windows NT;
- install Microsoft Excel
- configure all components

Microsoft Excel provides excellent data analysis, data process and data presentation functions and also gives a friend graphical user interface as a database front-end tool.

3.4 data publishing

The data stored in the BEPC database is also published on the Web. Figure 2 shows the data publishing architecture. By integrating Microsoft SQL Server and Microsoft internet information Server, we can publish the information in HTML format and provide a shortcut to the database. Users can get the current status of BEPC from the Web using any Web browser such as Microsoft Internet Explorer and Netscape Navigator.

3.5 Backup

For a computer based system, the most importation thing is the data, so the data backup process has the special position of the whole system. For our system, data have been backed up automatically on the disk and also on the tape store so that those useful data can be safely stored for a long time.

4 Conclusion

The BEPC on-line runtime database service system has been in operation since the October of 1996. During this eight consecutive months of machine operation, the state of the system has been stable. The system has stored over 300,000 groups of beam parameters. These parameters include the magnet power supply setpoints, the vacuum, the RF accelerating values and the beam diagnostic system parameters. All the data have been backed up on hard disk and also on magnetic tape. Technical support and data query services are also provided by our beam diagnostic workgroup.

References

[1] L.Ma, etal. "Using PCs in the BEPC beam diagnostic instrument system" ,this processing.
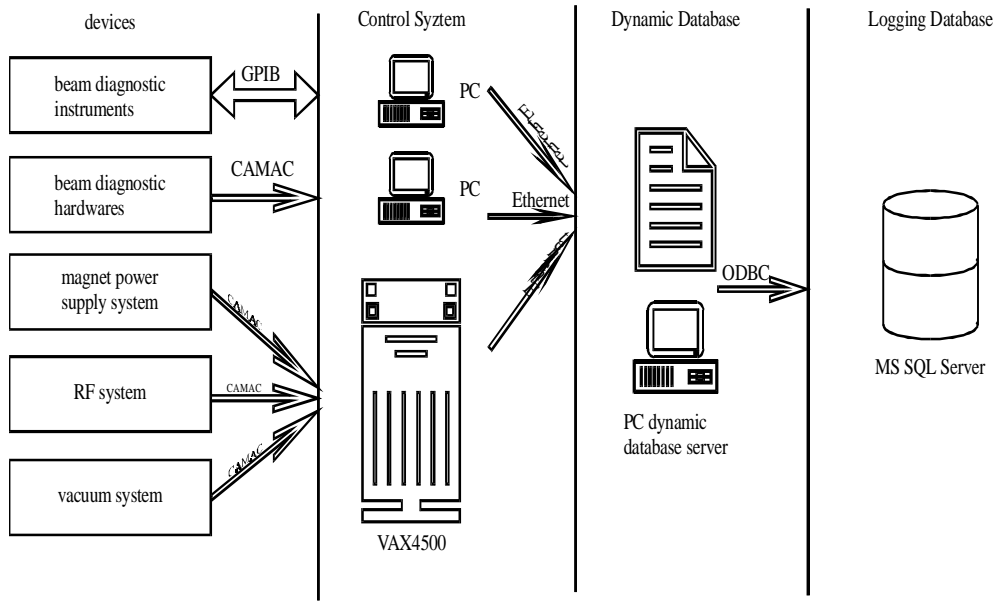[2] P.Shi, 'The data processing of BEPC beam diagnostic system" BEPC 96'
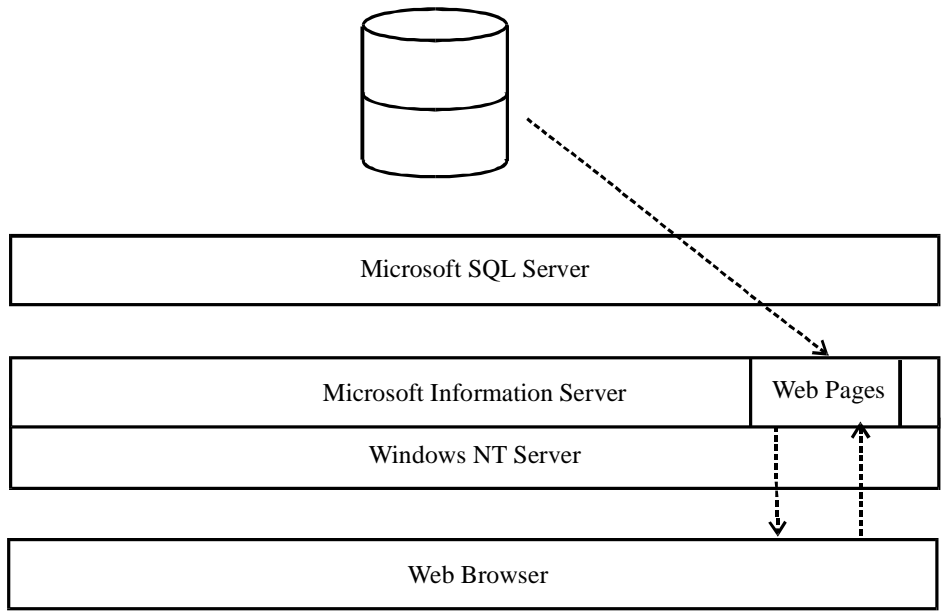
Figure 1 The architecture of data acquisition

Figure 2 The connection between the SQL Server and the Web browser